PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G11B 17/08, 17/24, 17/10, 17/035, 17/00, 17/22, 17/02 | A1

(11) International Publication Number: WO 99/23654

(43) International Publication Date: 14 May 1999 (14.05.99)

(21) International Application Number: PCT/KR98/00345

(22) International Filing Date: 30 October 1998 (30.10.98)

(30) Priority Data:

1997/56752	31 October 1997 (31.10.97)	KR
1997/56753	31 October 1997 (31.10.97)	KR
1997/56759	31 October 1997 (31.10.97)	KR

(81) Designated States: CN, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(71) Applicant: DAEWOO ELECTRONICS CO., LTD. [KR/KR]; 541, 5-Ga, Namdaemoon-Ro, Jung-ku, Seoul 100-095 (KR).

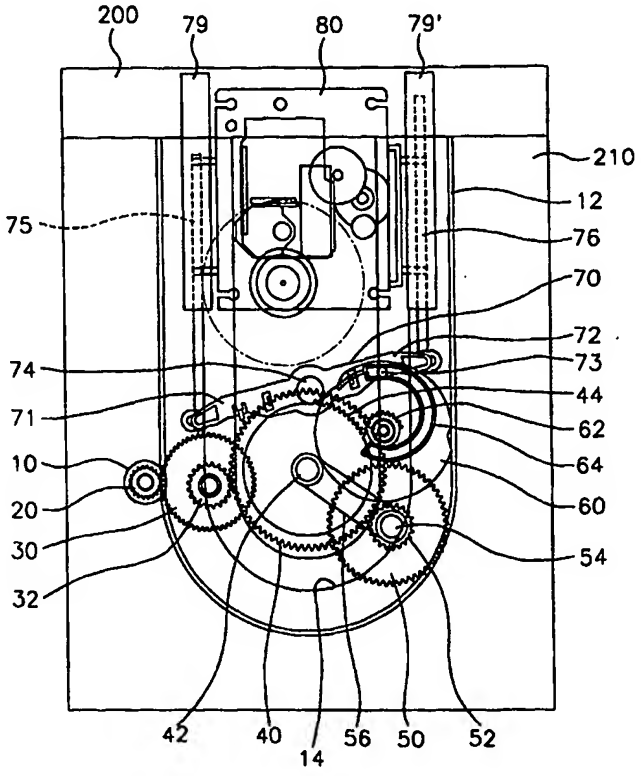
(72) Inventor: KIM, Hag-Ryeol; 963-14, Inkye-dong, Paldal-ku, Suwon-si, Kyunggi-do 442-070 (KR).

(74) Agent: NAM, Sang-Sun; The Korea Chamber of Commerce & Industry Building, 8th floor, #45, 4-Ga, Namdaemoon-Ro, Jung-ku, Seoul 100-094 (KR).

(54) Title: CD CHANGER WITH A DRIVING MECHANISM OPERATED BY A SINGLE DRIVING SOURCE

(57) Abstract

CD changer having a simple driving mechanism is disclosed which is driven by a single driving source for a movement of a tray and a lifting and lowering operation of a driving unit. Reduction gears rotate by a driving motor installed on a body, a main gear rotates by the rotation of the reduction gears. A pinion part rotates through the rotation of the main gear and moves a rack gear, thereby a tray moves. Also, a driving unit is lifted and lowered by the operation of a driving unit elevating means, resulting in reproducing a CD or stopping the operation of the CD's reproduction.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

CD CHANGER WITH A DRIVING MECHANISM OPERATED BY A SINGLE DRIVING SOURCE

TECHNICAL FIELD

1. Field of the Invention

This invention relates to a compact disk changer with a driving mechanism operated by a single driving source, more particularly a compact disk changer with a simple driving mechanism for moving a tray and a driving unit of compact disk changer driven by a single motor, by which the tray is ejected from and is loaded into a body and the driving unit is lifted and lowered.

BACKGROUND ART

In general, a conventional compact disk changer selects one of the disks loaded therein, and reproduces data from the selected compact disk(hereinafter, referred to as a CD) by an optical pick up device.

A CD changer consists of a number of members as shown in FIGS. 1 and 2. A tray 120 is movably installed on a body 100. A roulette 140 for placing a number of CDs is mounted on an upper face of the tray 120. The roulette 140 can be rotated at a predetermined angle to select a predetermined CD depending on an external output. A chucking plate 160 for chucking the center of the selected CD in a play mode is installed at an upper side of the roulette 140. A driving unit 180 is mounted at a lower side of the chucking plate 160 in the body 100. The driving unit 180 has an optical pick up device (not shown in figures) for reproducing data from the CD. To reproduce data from the selected CD, the driving unit 180 is lifted toward the chucking plate 160. The selected CD is chucked between the driving unit 190 and the chucking plate 160 and is rotated by

a motor. The optical pick up device reproduces data from the selected CD.

Under the roulette 140, there is a tray feeding part for ejecting the tray 120 from the body 100 and for loading the tray 120 to the body 100, a driving unit lifting part for lifting and lowering the driving unit 180, and a roulette driving part for rotating the roulette 140. The tray feeding part consists of a rack 210, a feeding motor 230, a reduction gear 250, a feeding gear 270, and a toggle switch 290. The rack 210 has a predetermined length and is installed at a side of the bottom face of the tray 120. The feeding motor 230 provides a driving power for moving the tray 120. The reduction gear 250 propagates the driving power of the feeding motor 230 to the feeding gear 270. The feeding gear 270 is engaged with the rack 210, and feeds the tray 120 depending on the rotation of the feeding motor 230. The toggle switch 290 is switched by a pushing portion 275 formed on the feeding gear 270 according to a position of the tray 120. The feeding motor 230 is controlled according to the state of the toggle switch 290.

The driving unit lifting part has a lifting motor 310 for providing the power to lift and lower the driving unit 180, a driving gear 330 engaged with the lifting motor 310, a cylindrical cam 350 engaged with the driving gear 330, and a second toggle switch 370 installed at a side of the cylindrical cam 350. A number of threads are formed on the periphery of the cylindrical cam 350, and are engaged with protrusions (not shown in figures) protruded from one side of the driving unit 180. The toggle switch 370 detects a lifting position of the driving unit 180 according to the rotation of the cylindrical cam 350, and controls the lifting motor 310. The other side of the driving unit 180 is connected to the body 100 by a hinge portion.

The roulette driving part has a roulette motor 147 for

providing power to rotate the roulette 140 and engages with a roulette gear 145 formed at the bottom face of the roulette 140.

A conventional CD changer as described above operates as follows.

First, in an ejection mode, control part(not shown) rotates the feeding motor 230 in the counterclockwise direction according to an ejecting signal from the exterior. The driving power of the feeding motor 230 propagates to the reduction gear 250 by a belt. The feeding gear 270 rotates in the counterclockwise direction by the reduction gear 250, and is engaged to the rack 210. Thus, the tray 120 is ejected from the body 100. That is, the roulette 140 is also ejected from the body 100. When the feeding gear 270 is rotated in a 360-degree arc, the pushing portion 275 turns on the toggle switch 290. The turn on signal of the toggle switch 290 is provided to the control part. The control part instructs the feeding motor 230 to stop. The user places a number of CDs on the roulette 140 installed at the tray 120.

Next, a loading mode is executed. The loading mode is to load the roulette 140 placing on a number of CDs and the tray 120 into the inner space of the body 100. The loading mode starts by providing a loading signal from the outside to the control part or by lightly pushing the tray 120 into the inner space of the body 100. The pushing portion 275 switches the toggle switch 290 to turn off. The control part drives the feeding motor 230 to rotate in the clockwise direction depending on the turning off signal of the toggle switch 290. According to the clockwise rotation of the feeding motor 230, the feeding gear 270 is rotated in the clockwise direction and starts to engage with the rack 210. Therefore, the tray 120 moves in the horizontal direction and is loaded toward the inner space of the body 100.

After the completion of the loading mode, the tray 120 is

placed into upper portion of the driving unit 180, and the roulette 140 is placed under the chucking plate 160. When a CD selecting signal is provided to the control part, the control part drives the roulette motor 147. The roulette motor 147 rotates the roulette gear 145. The roulette 140 is rotated by the roulette gear 145, and then the predetermined CD is selected. The selected CD is placed between the driving unit 180 and the chucking plate 160.

When a play mode signal is provided to the control part, the control part drives the lifting motor 310 to rotate. The driving power of the lifting motor 310 propagates into the cylindrical cam 350 via the driving gear 330. When the cylindrical cam 350 rotates, the driving unit 180 engaged with the cylindrical cam 350 rises about a hinge shaft. According to the rise of the driving unit 180, the selected CD is chucked between chucking plate 160 and the driving unit 180. The chucked CD is rotated by a motor(not shown), and the optical pick up device reproduces data from the selected CD.

However, a conventional CD changer has a feeding motor for providing the feeding power of the tray and a lifting motor for providing the lifting power of the driving unit separately. That is, as a number of motors are rotated, a CD receiving portion is joggled, and thus the CD changer has low reliability of reproducing true sound.

Also, the conventional CD changer is complicated because a number of gears are engaged between the feeding motor and the tray or between the lifting motor and the driving unit. Therefore, a numerous construction members and assembling procedures are required, increasing the manufacturing cost.

DISCLOSURE OF INVENTION

First object of this invention is to provide a CD changer with

a driving mechanism operated by a single driving source in which a tray and a driving unit are moved by a single motor.

Second object of this invention is to provide a CD changer with a driving mechanism operated by a single driving source to remove the complex vibration caused by the use of a number of motors.

Third object of this invention is to provide a CD changer with a driving mechanism operated by a single driving source to achieve a low manufacturing cost.

To obtain the objects, a CD changer with a driving mechanism operated by a single driving source according to a first preferred embodiment of the present invention comprises: a roulette having a plurality of disk housing portions for housing a plurality of compact disks; a tray having a rack gear and a loading recess formed in a lower side inside of said tray, and which can be ejected and loaded; a driving unit being lifted and lowered between a lifting position for a reproducing operation of the compact disk and a lowering position for stopping the reproducing operation, and having protruding ribs in both ends of both side walls of the driving unit for the lifting and lowering operation; a driving motor for operating an ejecting operation and a loading operation of the tray, and for operating the lifting operation and the lowering operation of the driving unit; a power transmitting part propagating the power from the driving motor; a main gear part rotated by the power transmitting part, integrally forming a first half gear on a lower surface, and rotatably mounted on the body through a central axis; a pinion part having a lower gear engaged with the main gear part and a central axis movable along the loading recess, and moving the rack gear engaged with the pinion part by rotation of the lower gear integrally formed on a lower portion of the pinion part; a connecting plate connecting the central axis of the main gear part with the central axis of the pinion part for

limiting a circular motion of the pinion part; and a driving unit elevating means lifting and lowering the driving unit through rotating power transmitted from the main gear part.

The loading recess is formed in a U-shape with a curved course and a straight course.

The rack gear is formed in a U-shape with a curved course and a straight course.

The power transmitting part includes a driving gear part rotated by driving power transmitted from the driving motor and a relay gear part engaged with the driving gear part and integrally forming an upper gear on an upper surface.

The driving unit elevating means includes a link rotatably mounted on the body through a pivot axis, and having a first arm and a second arm integrally forming a projection; a cam gear part having a second half gear engaged with the first half gear of the main gear part, and a guide rail formed at a rear surface of the cam gear part with a spiral shape and guiding the projection of the second arm so that the first arm and the second arm of the link are able to rotate about the pivot axis; a first operating rod and a second operating rod having sliding grooves in which the protruding ribs of the driving unit slide for being raised and lowered, and being connected with the first arm and the second arm of the link respectively; and both guide members guiding the first operating rod and the second operating rod, and vertically forming slits in both ends thereof.

In a second preferred embodiment of the present invention, the driving unit elevating means includes a link rotatably mounted on the body through a pivot axis, having a first arm and a second arm, and integrally forming a half gear engaged with the first half gear of the main gear part at a central side wall; a first operating rod and a second operating rod having sliding grooves in which the

protruding ribs of the driving unit slide for being lifted and lowered, and being connected with the first arm and the second arm of the link respectively; and both guide members guiding the first operating rod and the second operating rod, and vertically forming slits in both ends thereof.

A CD changer with a driving mechanism operated by a single driving source according to a third preferred embodiment of the present invention comprises: a roulette having a plurality of disk housing portions for housing a plurality of compact disks; a tray having a U-rack gear and a U-loading recess with a curved course and a straight course formed in a lower side inside of said tray, and which can be ejected and loaded; a driving unit being lifted and lowered between a lifting position for reproducing the compact disk and a lowering position for stopping the reproducing operation, and having protruding ribs in both ends of both side walls for the lifting and lowering operation; a driving motor for operating an ejecting operation and a loading operation of the tray, and for operating the lifting operation and the lowering operation of the driving unit; a driving gear part rotated by driving power transmitted from the driving motor; a relay gear part engaged with the driving gear part and integrally forming an upper gear having a small radius on an upper surface; a main gear part engaged with the upper gear of the relay gear part, and rotatably mounted on the body through a central axis; a pinion part having a lower gear engaged with the main gear part and a central axis movable along the loading recess, and moving the rack gear engaged with the pinion part by rotation of the lower gear integrally formed on a lower portion of the pinion part; a connecting plate connecting the central axis of the main gear part with the central axis of the pinion part for limiting a circular motion of the pinion part, extending one end portion of the

connecting plate to form in a fan shape, and having a half gear forming a series of teeth at a peripheral wall of an arc portion thereof; and a driving unit elevating means lifting and lowering the driving unit through rotating power transmitted from the main gear part, wherein the driving unit elevating means includes a link rotatably mounted on the body through a pivot axis, having a first arm and a second arm, and integrally forming a half gear engaged with the half gear of the connecting plate at a central side wall; a first operating rod and a second operating rod having sliding grooves in which the protruding ribs of the driving unit slide for being lifted and lowered, and being connected with the first arm and the second arm of the link respectively; and both guide members guiding the first operating rod and the second operating rod, and vertically forming slits in both ends thereof.

With the above-mentioned CD changer, a single motor drives the tray to eject from and to load into the body and the driving unit to be lifted and lowered.

Therefore, the driving mechanism for moving a tray and a driving unit by a single motor according to the present invention prevents the CD changer from complex vibration caused by use of two motors and achieves a low manufacturing cost.

As a result, the driving mechanism for moving a tray and a driving unit by a single motor according to the present invention improves the stability and reliability of operating conditions of disk players by the removal of a number of gearing connections.

BRIEF DESCRIPTION OF DRAWINGS

This invention will be better understood and its various objects and advantages will be more fully appreciated from the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view showing a general CD changer;

Fig. 2 is a plan view schematically showing a conventional CD changer;

Fig. 3 is a schematic view showing a driving mechanism of a CD changer in which a tray is loaded in a CD changer's body and a driving unit is lowered according to a first preferred embodiment of the present invention;

Fig. 4 is a schematic view showing a driving mechanism of the CD changer in which the tray is ejected from the CD changer's body and the driving unit is lowered according to the first preferred embodiment of the present invention;

Fig. 5 is a schematic view showing a driving mechanism of the CD changer in which the tray is loaded in the CD changer's body and the driving unit is lifted according to the first preferred embodiment of the present invention;

Fig. 6 is a schematic view showing a driving mechanism of the CD changer in which the tray is ejected from the CD changer's body and the driving unit is lifted according to the first preferred embodiment of the present invention;

Fig. 7 is a sectional view of the driving mechanism in the CD changer of Fig. 3;

Fig. 8A and Fig. 8B are schematic views showing an operating status of a first operating rod and a second operating rod and a moving status of protruding ribs formed on the driving unit in a lifting mode and a lowering mode of the driving unit according to the first preferred embodiment of the present invention;

Fig. 9 is a schematic view showing a driving mechanism of a CD changer in which a tray is loaded in a CD changer's body and a driving unit is lowered according to a second preferred embodiment of the present invention;

Fig. 10 is a schematic view showing a driving mechanism of the

CD changer in which the tray is ejected from the CD changer's body and the driving unit is lowered according to the second preferred embodiment of the present invention;

Fig. 11 is a schematic view showing a driving mechanism of the CD changer in which the tray is loaded in the CD changer's body and the driving unit is lifted according to the second preferred embodiment of the present invention;

Fig. 12 is a schematic view showing a driving mechanism of the CD changer in which the tray is ejected from the CD changer's body and the driving unit is lifted according to the second preferred embodiment of the present invention;

Fig. 13A and Fig. 13B are schematic views showing an operating status of a first operating rod and a second operating rod and a moving status of protruding ribs formed on the driving unit in a lifting mode and a lowering mode of the driving unit according to the first preferred embodiment of the present invention;

Fig. 14 is a schematic view showing a driving mechanism of a CD changer in which a tray is loaded in a CD changer's body and a driving unit is lowered according to a third preferred embodiment of the present invention;

Fig. 15 is a schematic view showing a driving mechanism of the CD changer in which the tray is ejected from the CD changer's body and the driving unit is lowered according to the third preferred embodiment of the present invention;

Fig. 16 is a schematic view showing a driving mechanism of the CD changer in which the tray is loaded in the CD changer's body and the driving unit is lifted according to the third preferred embodiment of the present invention;

Fig. 17 is a schematic view showing a driving mechanism of the CD changer in which the tray is ejected from the CD changer's body and the driving unit is lifted according to the third preferred

embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, this invention will be described in detail with reference to the drawings.

The same member of an invention appearing in more than one view of the drawings will always be designated by the same reference number, and the same reference number will never be used to designate different members.

Referring to Fig. 3 through Fig. 8B, a first preferred embodiment according to the present invention is illustrated in detail.

According to this invention, a tray 210 has a U-rack gear and a U-loading recess formed in a lower side inside of the tray. A driving unit is lifted and lowered between a lifting position and a lowering position. A single driving motor 10 generates driving power and the driving power is transmitted to a power transmitting part. The power transmitting part consists of a driving gear part 20 and a relay gear part 30. The driving gear part 20 is rotated by the driving motor 10 installed on a CD changer's body 200. The relay gear part 30 has a small-radius upper gear 32 for increasing rotating power in an upper surface thereof. A main gear part 40 is engaged with the upper gear 32 of the relay gear part and integrally forms a first half gear 44 on a lower surface. A pinion part 50 is engaged with the rack gear 12 and has a lower gear engaged with the main gear part 40. Also, a driving unit elevating means lifts and lowers the driving unit through a rotation of the main gear part 40.

The loading recess 14 is formed in a U-shape at a lower side of the tray inside.

The rack gear 12 is formed in a U-shape with a curved course

on which the pinion part 50 has a circular motion along the loading recess 14 and a straight course moving the rack gear 12 by a rotation of the pinion part 50.

A connecting plate 56 connects a central axis 42 of the main gear part 40 and a central axis 54 of the pinion part 50.

Thus, in the curved course, the lower gear 52 of the pinion part 50 moves in a clockwise direction and a counterclockwise direction along the loading recess 14 about the central axis 42 of the main gear part 40 in an engagement with the main gear part 40.

In the straight course, because the circular motion of the connecting plate 56 is limited, the pinion part 50 moves the rack gear 12.

The pinion part 50 has the small-radius lower gear 52 in the lower surface thereof and engages with the main gear part 40, resulting in transmitting high rotating power to the rack gear 12.

The driving unit elevating means includes a link 70, a cam gear part 60, a first operating rod 75, a second operating rod 78, and guide members 79,79'.

The link 70 is rotatably mounted on the body 200 through a pivot axis 74, having a first arm 71 and a second arm 72 integrally forming a projection 73.

The cam gear part 60 has a second half gear 62 engaged with the first half gear 44 of the main gear part 40, and a guide rail 64 formed at a rear surface of the cam gear part 60. The guide rail 64 with a spiral shape guides the projection 73 of the second arm 72 so that the first arm 71 and the second arm 72 of the link 70 are able to rotate about the pivot axis 74.

The first operating rod 75 and The second operating rod 76 have sliding grooves 78,78' in which the protruding ribs 77,77' of the driving unit 80 slide for being lifted and lowered, and connected with the first arm 71 and the second arm 72 of the link 70

respectively.

Also, both guide members 79,79' guides the first operating rod 75 and the second operating rod 76, and has slits vertically formed at both ends thereof.

Furthermore, this invention includes a tray open sensing switch(not shown) sensing an entire ejection of the tray from the body by contacting the rack gear 12, and a chucking completing switch(not shown) sensing the CD's chucking of the driving unit 80 by contacting the first operating rod 75 and the second operating rod 76 of the link 70.

Hereinafter, the operation of the driving mechanism according to a first embodiment of the present invention will be described.

Fig. 3 is a schematic view schematically showing a driving mechanism of a CD changer in which a tray is loaded in a CD changer's body and a driving unit is lowered according to a first preferred embodiment of the present invention.

At the time of ejecting the tray 210 which is loaded in the body 200, the driving gear part 20 is rotated counterclockwise by the driving motor, rotates the relay gear part 30, and thus rotates the main gear part 40 through the upper gear 32 of the relay gear part 30 in the counterclockwise direction. By the rotation of the main gear part 40, the pinion part 50 and the lower gear 52 engaged with the main gear part 40 rotate in the clockwise direction. The pinion part 50 engages with the straight course of the rack gear 12 and thus moves the rack gear 12. Therefore, the tray 210 is ejected toward the outside of the body 200.

When the central axis 54 of the lower gear 52 moves along the loading recess 14, in the curved course of the loading recess 14 the central axis 54 has the circular motion and in the straight course the circular motion of the central axis 54 is limited by means of the connecting plate connected to the central axis 42 of

the main gear part 40. Therefore, in the straight course, the rotation of the pinion part 50 is transmitted to the rack gear 12, resulting in moving the rack gear 12.

Furthermore, the cam gear part 60 does not rotate because the second half gear 62 does not engage with the first half gear.

The driving mechanism in the ejecting mode of the tray is shown in Fig. 4.

After the user places a number of CDs on the roulette installed at the tray 210, he lightly pushes the tray 210 into the inside of the body 200. The driving motor 10 is operated by a control part (not shown), and the driving gear part 20 rotates in the clockwise direction by the operation of the driving motor 10. The driving gear part 20 rotates the pinion part 50 in the counterclockwise direction through the relay gear part 30 and the main gear part 40. The pinion part 50 is engaged with the rack gear 12, and the tray 210 is loaded into the inside of the body 200. Therefore, the CD placed on the roulette installed in the tray 210 is placed over the driving unit 80.

Furthermore, the cam gear part 60 does not rotate because the second half gear 62 does not engage with the first half gear.

The driving mechanism in the loading mode of the tray is shown in Fig. 4.

When lifting the driving unit 80 for reproducing the CD, as shown in Fig. 3, the driving motor 10 is operated by a control part(not shown), and the driving gear part 20 rotates in the clockwise direction by the operation of the driving motor 10. The driving gear part 20 rotates the pinion part 50 in the counterclockwise direction through the relay gear part 30 and the main gear part 40. The pinion part 50 is engaged with the curved course of the rack gear 12. The pinion part causes the circular motion about the central axis 42 of the main gear part 40, and thus

moves in the left of the body 200.

Furthermore, because the main gear part 40 rotates in the clockwise direction, the first half gear 44 of the main gear part 40 is engaged with the second half gear(62) of the cam gear part 60, resulting in rotating the cam gear part 60 in the counterclockwise direction.

By the rotation of the cam gear part 60, the projection 73 of the link 70 moves toward the center portion of the spiral shape along the track of the guide rail 64. Accordingly, the first arm 71 and the second arm 72 rotate by a predetermined angle about the pivot axis 74 in the clockwise direction.

By means of the rotation of the first arm 71 and the second arm 72, the first operating rod 75 and the second operating rod 76 move horizontally. The protruding ribs 77,77' of the driving unit 80 move in a vertical upstream direction along the sliding grooves 78,78' formed on the first operating rod 75 and the second operating rod 76, thereby the driving unit 80 is lifted.

The protruding ribs 77,77' are supported by the slits 90,90' which are vertically formed on the guide members for guiding the horizontal movement of the first operating rod 75 and the second operating rod 76.

The driving mechanism in which the tray 210 is loaded in the inside of the body 200 and the driving unit 80 is lifted, is shown in Fig. 5. In the above status, the CD may be reproduced.

The operation which lowers the driving unit 80 for stopping the CD's reproduction may be attained by driving the above mentioned operation for reproducing the CD in the reverse direction.

When ejecting the tray 200 outside of the body 200 for changing another CD simultaneously with reproducing the selected CD, as shown in Fig. 5, the driving motor 10 is operated by a control

part(not shown), and the driving gear part 20 rotates in the clockwise direction by the operation of the driving motor 10. The driving gear part 20 rotates the pinion part 50 in the counterclockwise direction through the relay gear part 30 and the main gear part 40.

Because the central axis 54 of the pinion part 50 is placed in the straight course of the loading recess 14, the circular motion of the central 54 connected to the connecting plate 56 is limited in the loading recess 14. Accordingly, the pinion part 50 engaged with the rack gear 12 rotates consistently, thereby the rack gear 12 moves horizontally and thus the tray 210 moves into the outside of the body 200.

Because the first half gear 44 of the main gear part 40 is not engaged with the second half gear 62 of the cam gear 60, the cam gear part 60 does not rotate and thus the driving unit 80 maintains the lifting status(the reproducing mode of the CD).

The driving mechanism in which the tray 210 is ejected from the inside of the body 200 and the driving unit 80 is lifted, is shown in Fig. 6.

When loading the tray 210 inside of the body 200, as shown in Fig.6, the driving motor 10 is operated by a control part(not shown), and the driving gear part 20 rotates in the counterclockwise direction by the operation of the driving motor 10. The driving gear part 20 rotates the pinion part 50 in the clockwise direction through the relay gear part 30 and the main gear part 40. Therefore, the rack gear 12 moves horizontally and the tray 210 is loaded into the body 200.

The driving mechanism in which the tray 210 is loaded inside of the body 200 and the driving unit 80 is lifted, is shown in Fig. 5.

Fig. 7 is a sectional view of the driving mechanism in the CD

changer of Fig. 3.

Fig. 8A shows the status when the driving unit 60 is in the lowering position, in which the protruding ribs 77,77' of the driving unit 60 are placed on the lower portion of the sliding grooves 78,78' formed on the first operating rod 75 and the second operating rod 76.

Fig. 8B shows the status when the driving unit 60 is in the lifting position, in which the protruding ribs 77,77' of the driving unit 60 are placed on the upper portion of the sliding grooves 78,78' formed on the first operating rod 75 and the second operating rod 76.

Accordingly, the protruding ribs 77,77' move along the sliding grooves 78,78' by means of the operation of the first operating rod and the second operating rod.

The guide members 79,79' guiding the first operating rod 75 and the second operating rod 76 are formed on the body 200, and include the slits 90,90' for guiding and supporting the protruding ribs 77,77' which are guided into the upper portion and the lower portion along the sliding grooves 78,78'.

Hereinafter, referring to Fig. 9 through Fig. 13B, a second preferred embodiment according to the present invention is illustrated in detail.

In a driving unit elevating means according to the second preferred embodiment of the present invention, a link 85 is rotatably mounted on the body 200 through a pivot axis 84, having a first arm 81 and a second arm 82. Also, the link 85 integrally forms a half gear 83 engaged with the first half gear 44 of the main gear part 40 at a central side wall.

A first operating rod 75 and a second operating rod 76 have sliding grooves 88,88' in which the protruding ribs 77,77' of the driving unit 80 slide for being lifted and lowered, and being

connected with the first arm 81 and the second arm 82 of the link 85 respectively.

Also, both guide members 79,79' guide the first operating rod 75 and the second operating rod 76, and have slits 90,90' vertically forming at both ends thereof.

Fig. 9 shows the status when the driving unit 80 is in the lowering position.

The driving gear part 20 rotates in the clockwise direction through the driving motor 10, and thus the relay gear part 30 rotates in the counterclockwise direction. The main gear part 40 rotates in the clockwise direction by the rotation of the relay gear part 30, and thus the first half gear 44 of the main gear part 40 is engaged with the half gear 83 of the link 85. Therefore, the first arm 81 and the second arm 82 of the link 85 rotate by a predetermined angle in the counterclockwise direction about the pivot axis 84.

By means of the rotation of the first arm 81 and the second arm 82, the first operating rod 75 and the second operating rod 76 move horizontally. Accordingly, the protruding ribs 77,77' of the driving unit 80 move into the upper portion along the sliding grooves 88,88' formed on the first operating rod 75 and the second operating rod 76, resulting in lifting the driving unit 80.

The protruding ribs 77,77' are guided and supported by the slits 90,90' which are vertically formed at both ends of the guide members 79,79' guiding the first operating rod 75 and the second operating rod 76.

When the driving unit 80 operates in the lifting mode, the pinion part 50 circularly moves along the loading recess 14 through the clockwise rotation of the main gear part 40, and thus moves in the left side of the body 200 (shown in Fig. 11).

According to the above-mentioned operation, the optical

pickup apparatus of the drive unit 80 reproduces the data of the selected CD.

Furthermore, the operation which lowers the driving unit 80 for stopping the CD's reproduction may be attained by driving the above-mentioned operation for reproducing the CD in the reverse direction.

The illustration about the constitution and the operation in which the tray is ejected from and is loaded into the body are similar to the above mentioned first embodiment.

Hereinafter, referring to Fig. 14 through Fig. 17, a third preferred embodiment according to the present invention is illustrated in detail.

As shown in Fig 14, a connecting plate connects the central axis of the main gear part with the central axis of the pinion part for limiting a circular motion of the pinion part. The connecting plate extends one end portion of the connecting plate to form in a fan shape, and has a half gear forming a series of teeth at a peripheral wall of an arc portion thereof.

For reproducing the selected CD, the half gear 63 of the connecting plate 66 is engaged with the half gear 83 of the link 85, and thus lifts the driving unit 80 through the operation of the driving unit elevating means.

Furthermore, the operation which lowers the driving unit 80 for stopping the CD's reproduction may be attained by driving the above-mentioned operation for reproducing the CD in the reverse direction.

The illustration about the constitution and the operation of the constructing members are similar to the above mentioned embodiments.

Like the above-mentioned illustration, the CD changer according to the present invention has a driving mechanism

operated by a single driving source, and effectively executes the ejecting and loading operation of the tray and the lifting and lowering operation of the driving unit.

As a result, the CD changer is simple in structure, has a reduction in the number of constituent member and assembling steps, and achieves high productivity and a low manufacturing cost.

While this invention has been particularly shown and described with reference to particular embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the spirit and scope of the invention as defined by the appended claims.

CLAIMS

1. A compact disk changer with a driving mechanism operated by a single driving source, comprising:

a tray having a rack gear and a loading recess formed in a lower side inside of said tray, and which can be ejected and loaded;

a driving unit being lifted and lowered between a lifting position for a reproducing operation of the compact disk and a lowering position for stopping the reproducing operation, and having protruding ribs in both ends of both side walls of the driving unit for the lifting and lowering operation;

a driving motor for operating an ejecting operation and a loading operation of the tray, and for operating the lifting operation and the lowering operation of the driving unit;

a driving unit elevating means lifting and lowering the driving unit; and

a gear train means engaged with the rack gear for ejecting or loading the tray by means of power of the driving motor, and engaged with one side of the driving unit elevating means for lifting and lowering the driving unit.

2. The compact disk changer with a driving mechanism operated by a single driving source according to claim 1, wherein the gear train means includes:

a driving gear part rotated by driving power transmitted from the driving motor;

a relay gear part engaged with the driving gear part and integrally forming an upper gear on an upper surface

a main gear part rotated by the relay gear part, integrally forming a first half gear on a lower surface, and rotatably mounted on the body through a central axis;

a pinion part having a lower gear engaged with the main gear

part and a central axis movable along the loading recess, and moving the rack gear engaged with the pinion part by rotation of the lower gear integrally formed on a lower portion of the pinion part; and

a connecting plate connecting the central axis of the main gear part with the central axis of the pinion part for limiting a circular motion of the pinion part.

3. The compact disk changer with a driving mechanism operated by a single driving source according to claim 1, wherein the loading recess is formed in a U-shape with a curved course and a straight course.

4. The compact disk changer with a driving mechanism operated by a single driving source according to claim 1, wherein the rack gear is formed in a U-shape with a curved course and a straight course.

5. The compact disk changer with a driving mechanism operated by a single driving source according to claim 1, wherein the driving unit elevating means includes:

a link rotatably mounted on the body through a pivot axis, and having a first arm and a second arm integrally forming a projection;

a cam gear part having a second half gear engaged with the first half gear of the main gear part, and a guide rail formed at a rear surface of the cam gear part with a spiral shape and guiding the projection of the second arm so that the first arm and the second arm of the link are able to rotate about the pivot axis;

a first operating rod and a second operating rod having sliding grooves in which the protruding ribs of the driving unit

slide for being raised and lowered, and being connected with the first arm and the second arm of the link respectively; and

both guide members guiding the first operating rod and the second operating rod, and vertically forming slits in both ends thereof.

6. The compact disk changer with a driving mechanism operated by a single driving source according to claim 1, wherein the driving unit elevating means includes:

a link rotatably mounted on the body through a pivot axis, having a first arm and a second arm, and integrally forming a half gear engaged with the first half gear of the main gear part at a central side wall;

a first operating rod and a second operating rod having sliding grooves in which the protruding ribs of the driving unit slide for being lifted and lowered, and being connected with the first arm and the second arm of the link respectively; and

both guide members guiding the first operating rod and the second operating rod, and vertically forming slits in both ends thereof.

7. A compact disk changer with a driving mechanism operated by a single driving source, comprising:

a tray having a U-rack gear and a U-loading recess with a curved course and a straight course formed in a lower side inside of said tray, and which can be ejected and loaded;

a driving unit being lifted and lowered between a lifting position for reproducing the compact disk and a lowering position for stopping the reproducing operation, and having protruding ribs in both ends of both side walls for the lifting and lowering operation;

a driving motor for operating an ejecting operation and a loading operation of the tray, and for operating the lifting operation and the lowering operation of the driving unit;

a driving gear part rotated by driving power transmitted from the driving motor;

a relay gear part engaged with the driving gear part and integrally forming an upper gear having a small radius on an upper surface;

a main gear part engaged with the upper gear of the relay gear part, and rotatably mounted on the body through a central axis;

a pinion part having a lower gear engaged with the main gear part and a central axis movable along the loading recess, and moving the rack gear engaged with the pinion part by rotation of the lower gear integrally formed on a lower portion of the pinion part;

a connecting plate connecting the central axis of the main gear part with the central axis of the pinion part for limiting a circular motion of the pinion part, extending one end portion of the connecting plate to form in a fan shape, and having a half gear forming a series of teeth at a peripheral wall of an arc portion thereof; and

a driving unit elevating means lifting and lowering the driving unit through rotating power transmitted from the main gear part,

wherein the driving unit elevating means includes a link rotatably mounted on the body through a pivot axis, having a first arm and a second arm, and integrally forming a half gear engaged with the half gear of the connecting plate at a central side wall;

a first operating rod and a second operating rod having sliding grooves in which the protruding ribs of the driving unit slide for being lifted and lowered, and being connected with the

first arm and the second arm of the link respectively; and

both guide members guiding the first operating rod and the second operating rod, and vertically forming slits in both ends thereof.

FIG. 1
PRIOR ART

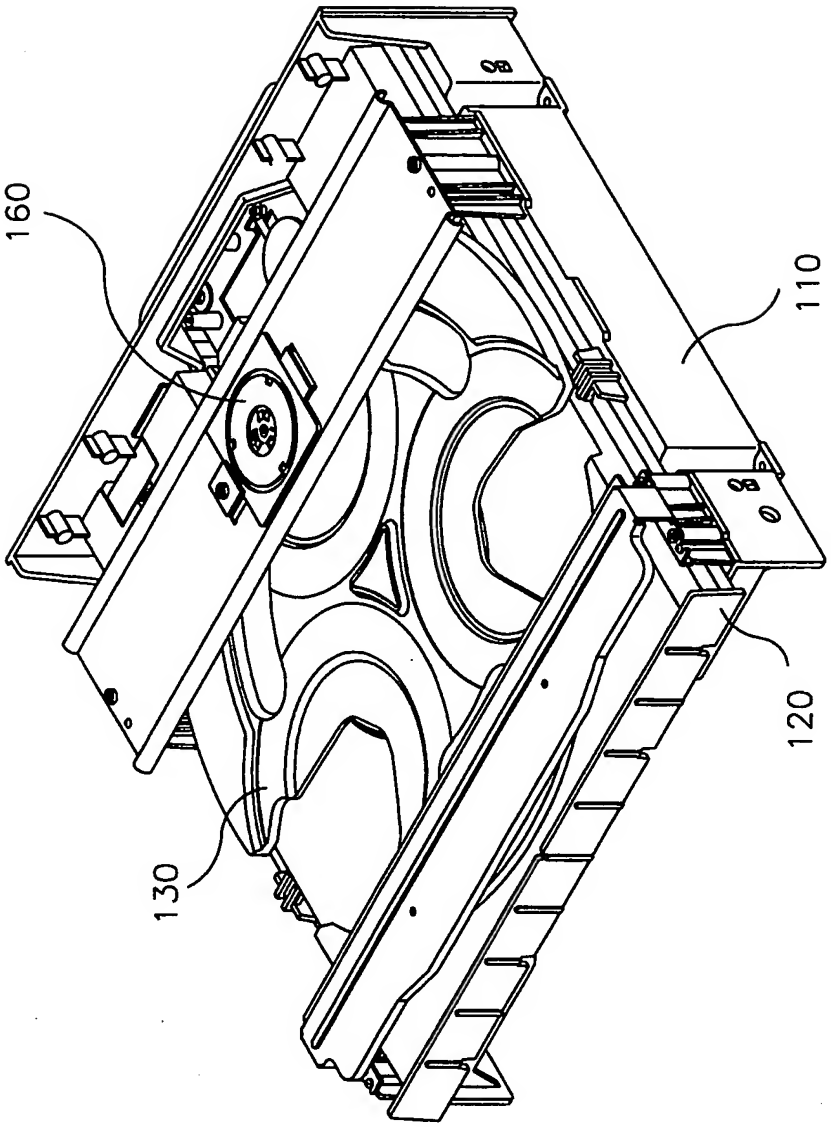
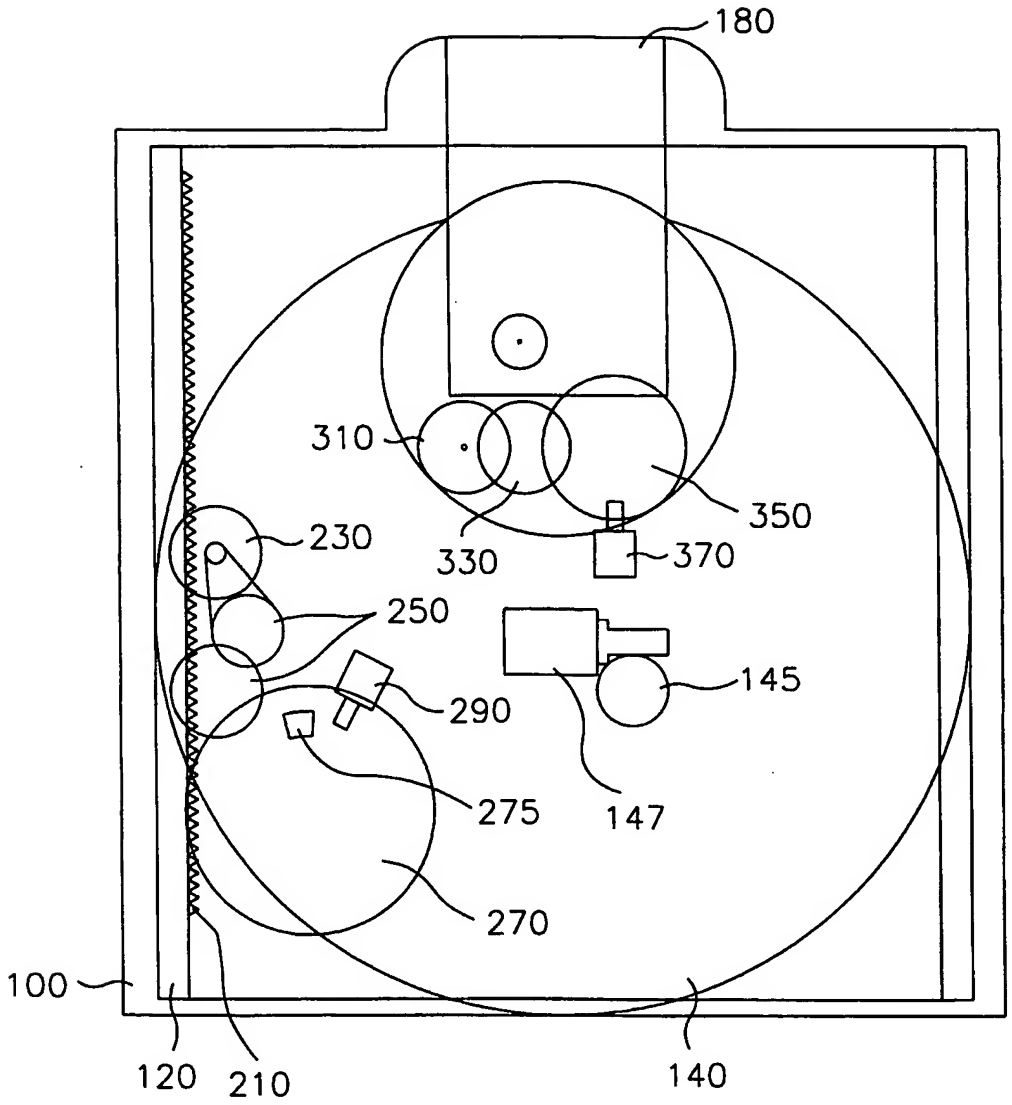


FIG.2
PRIOR ART



3/19

FIG.3

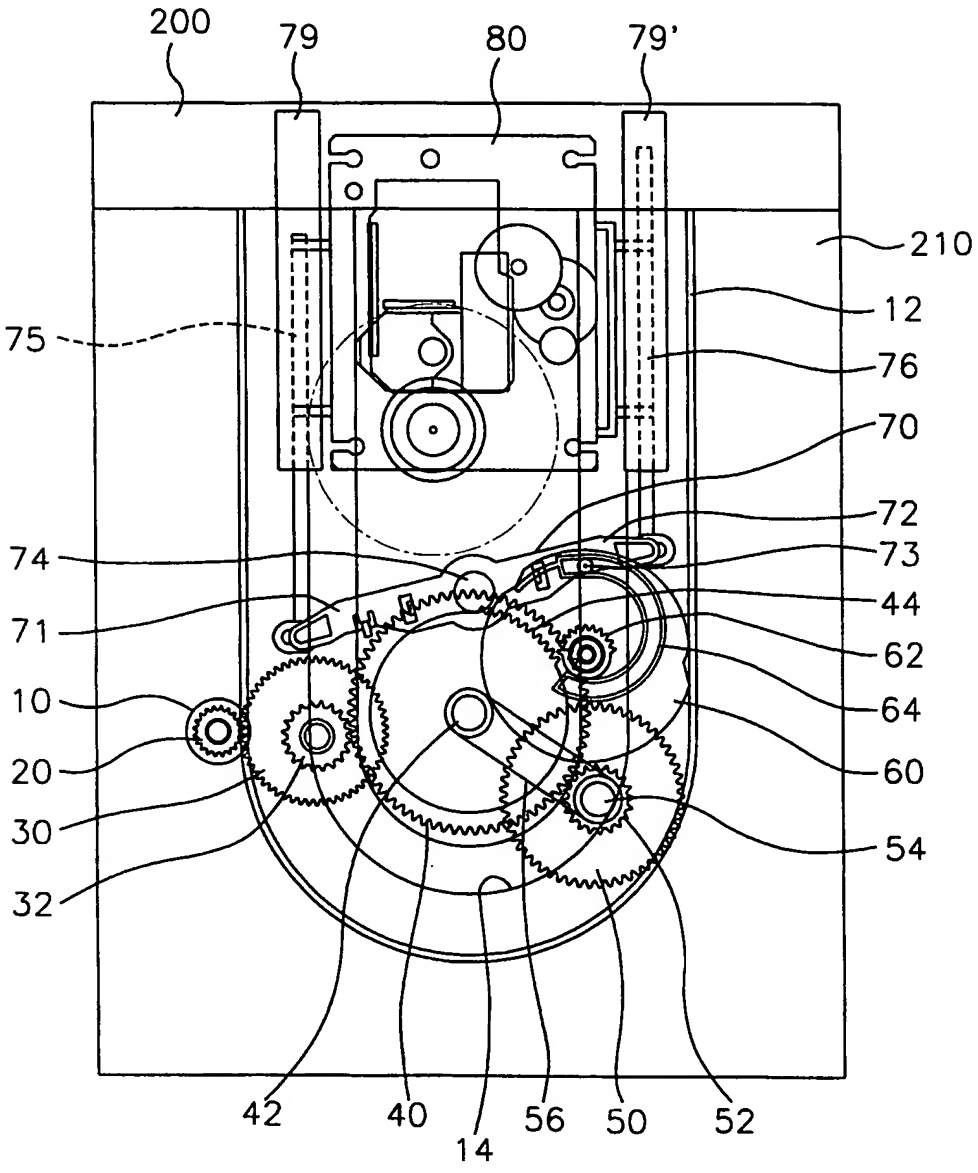

200
79
80
79'
210
12
75
76
70
72
74
73
71
44
62
10
64
20
60
30
54
32
42
40
14
56
50
52

FIG.4

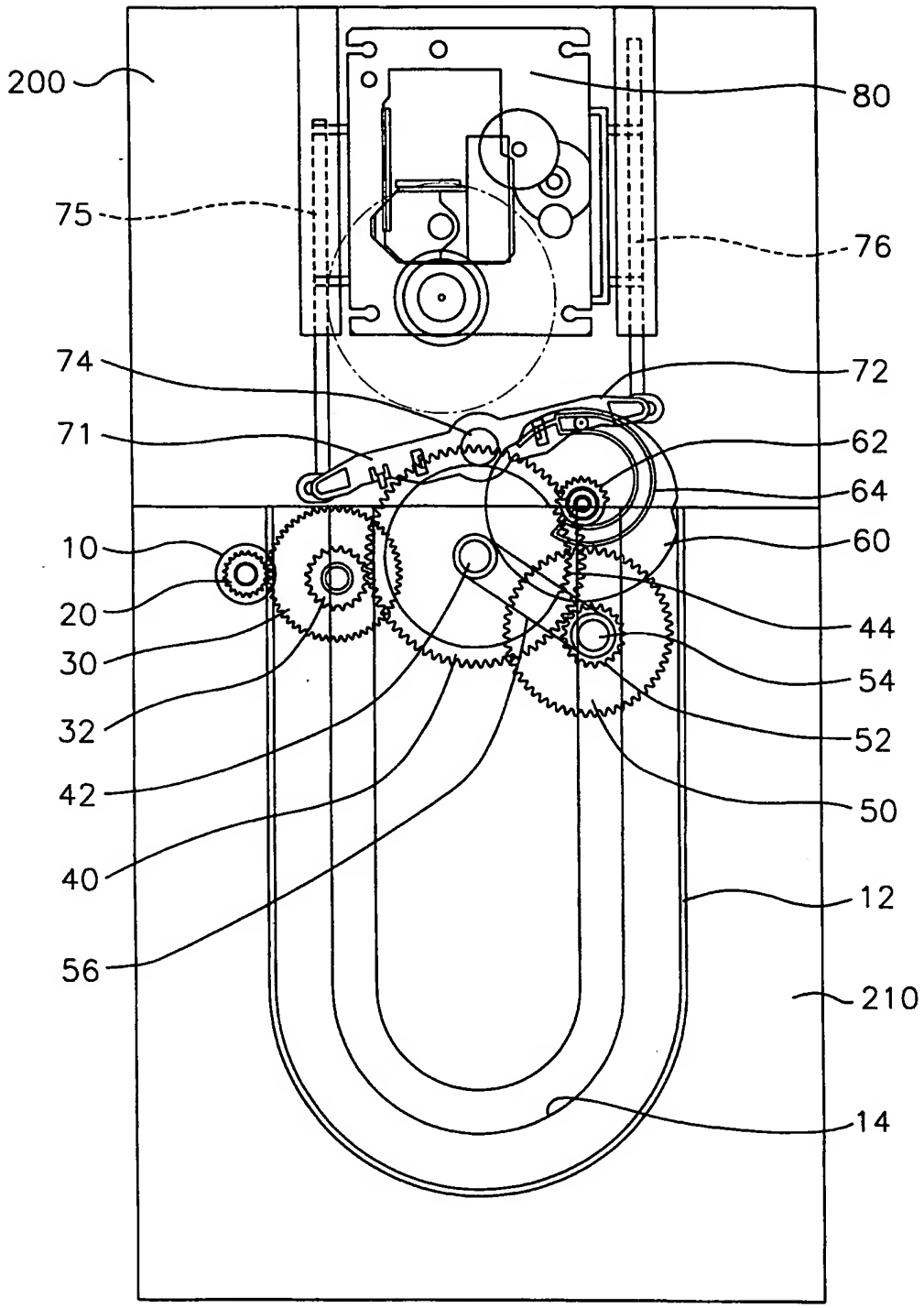

200
80
75
76
74
72
71
62
64
10
60
20
44
30
54
32
52
42
50
40
12
56
210
14

FIG.5

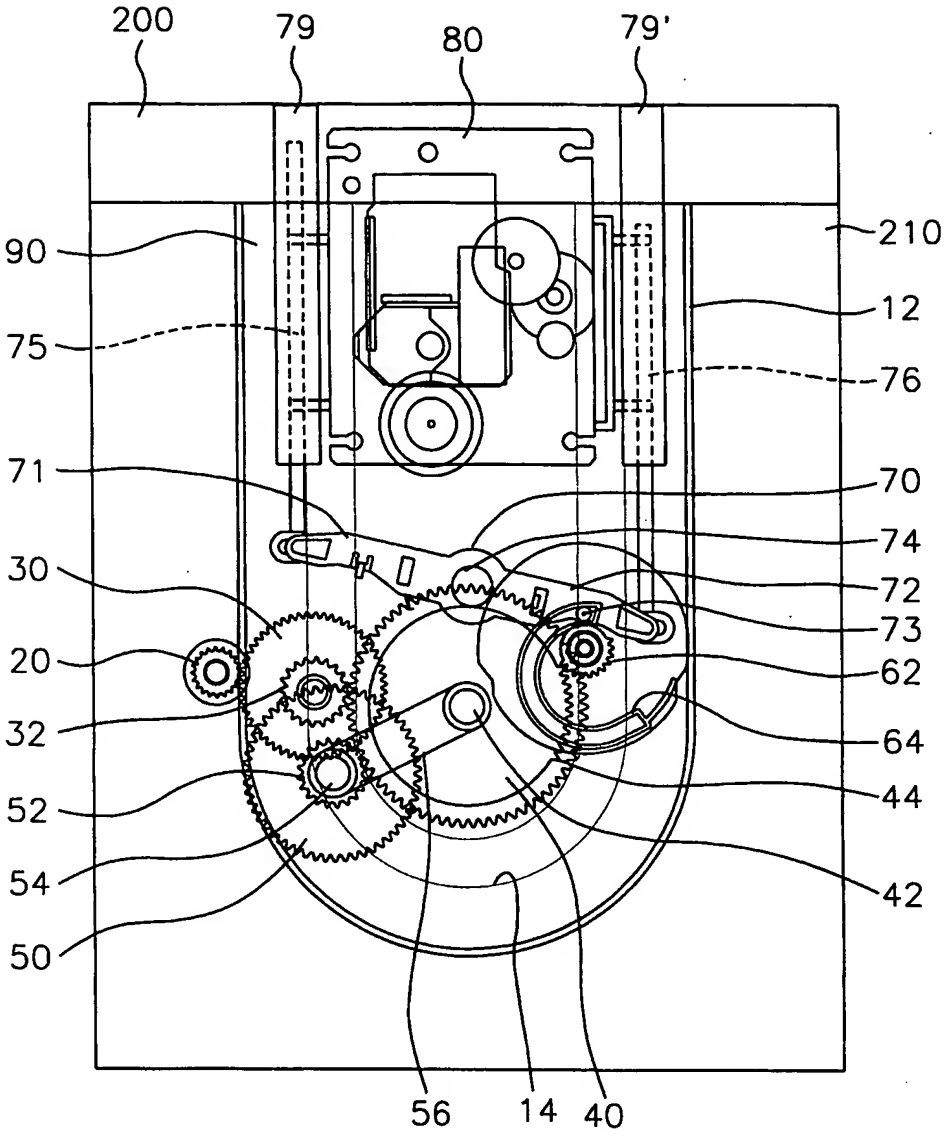

200
79
80
79'
210
90
12
75
76
71
70
74
30
72
73
20
62
32
64
52
44
54
42
50
56
14
40

FIG.6

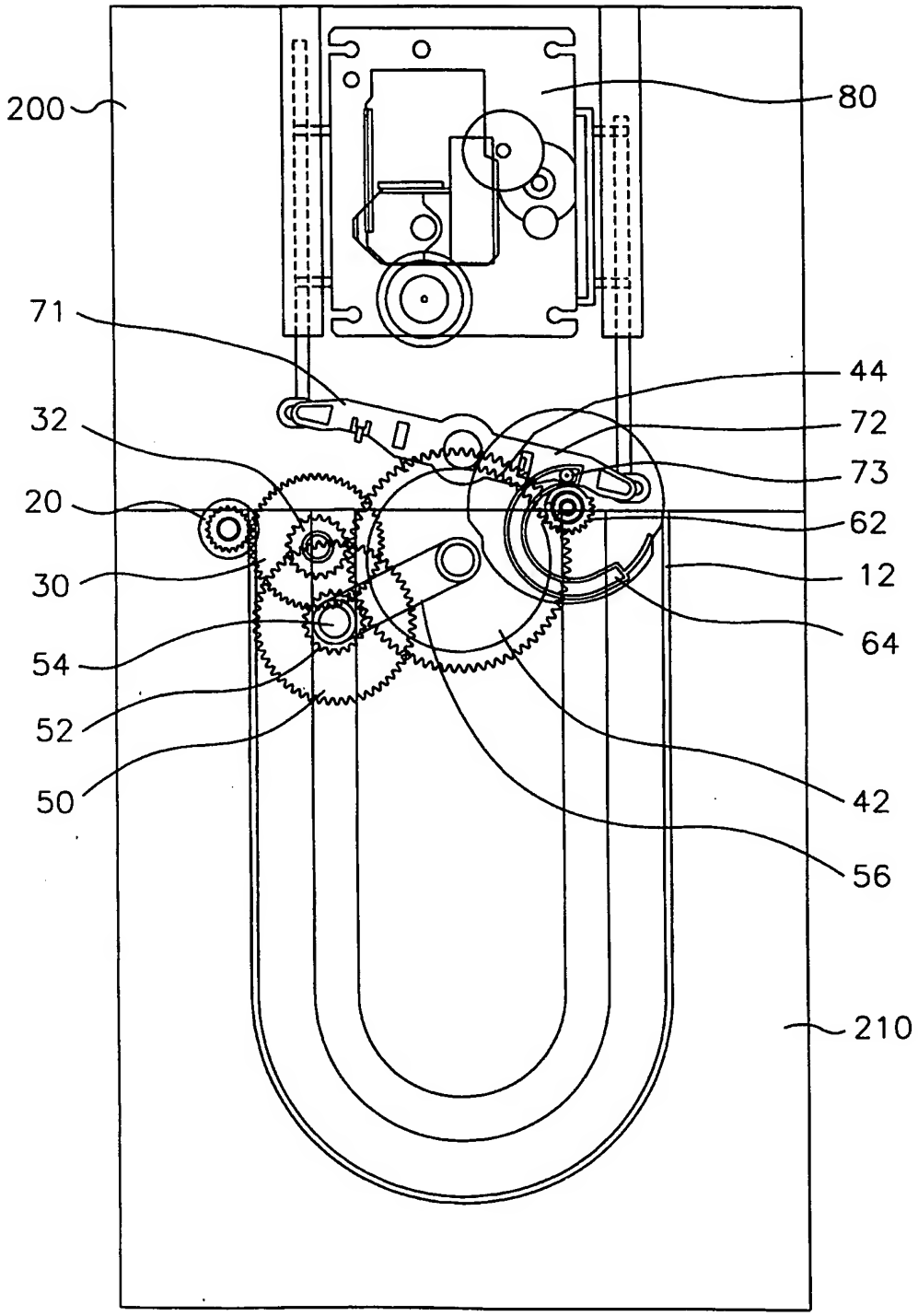


FIG.7

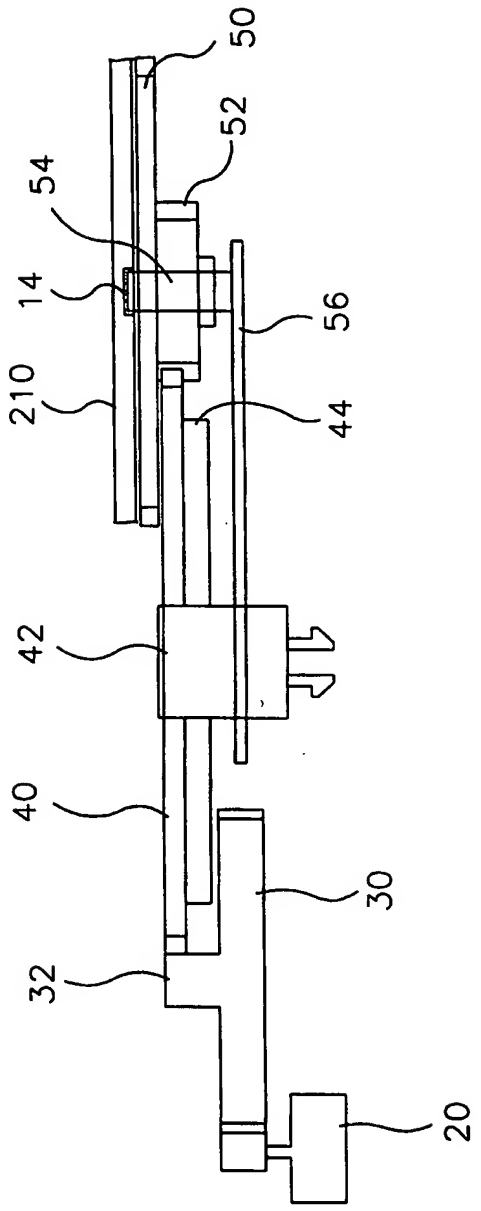


FIG.8A

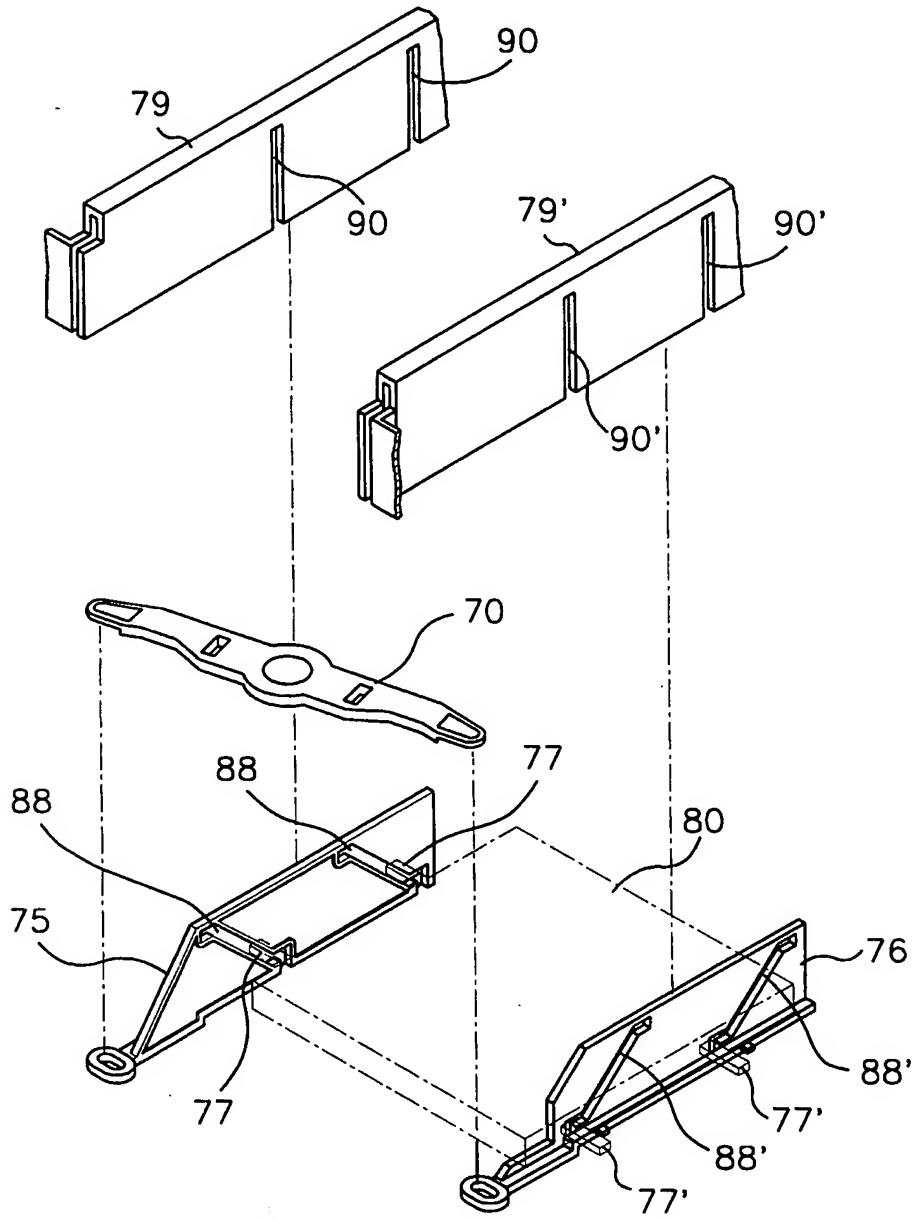


FIG.8B

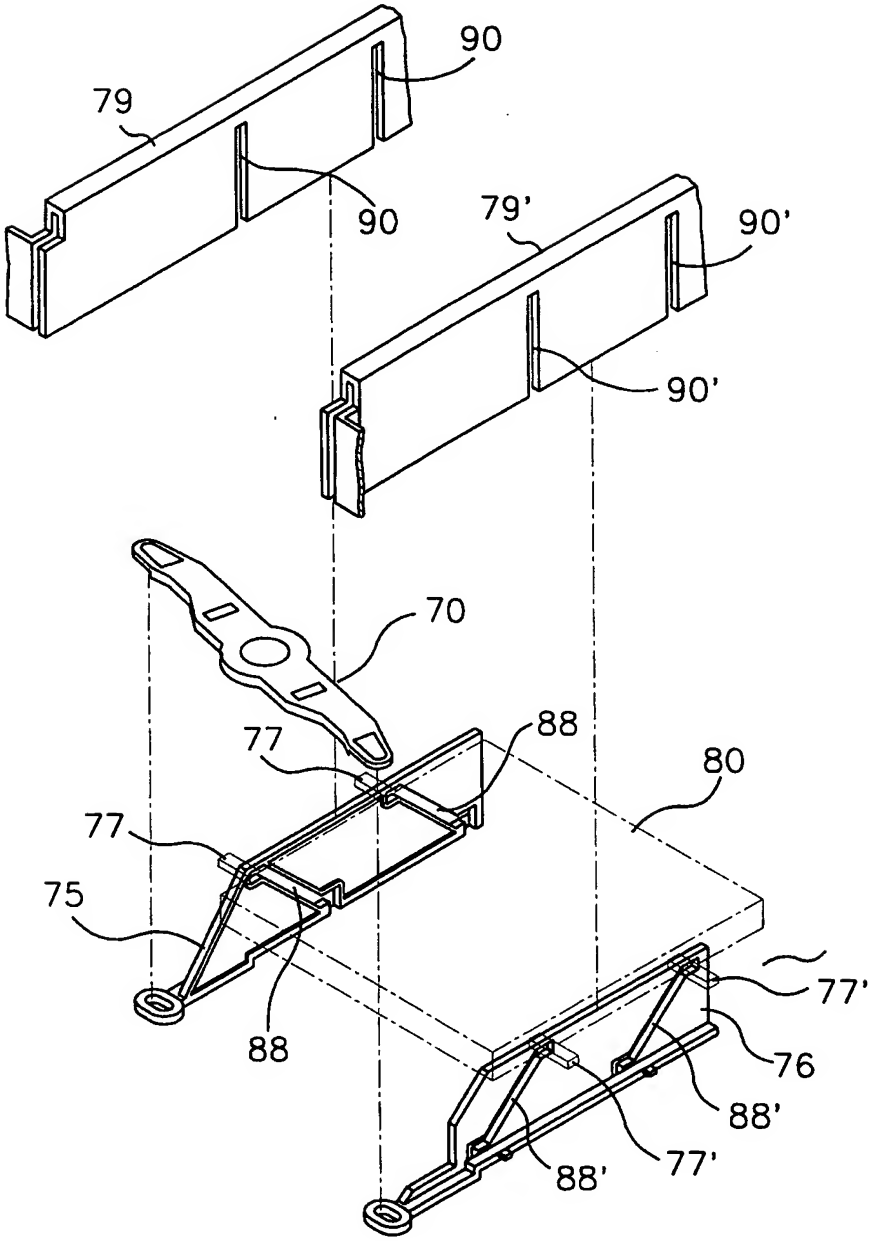


FIG.9

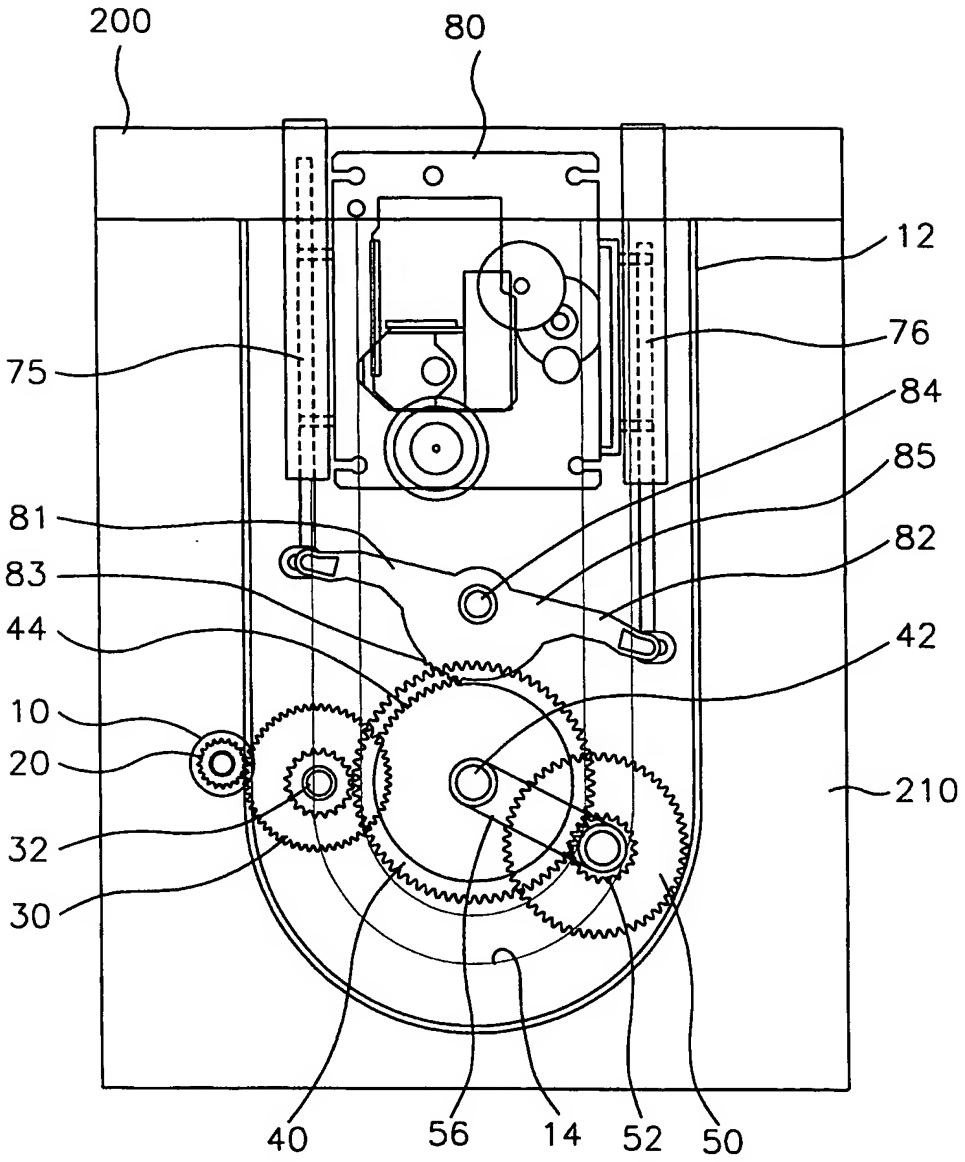


FIG.10

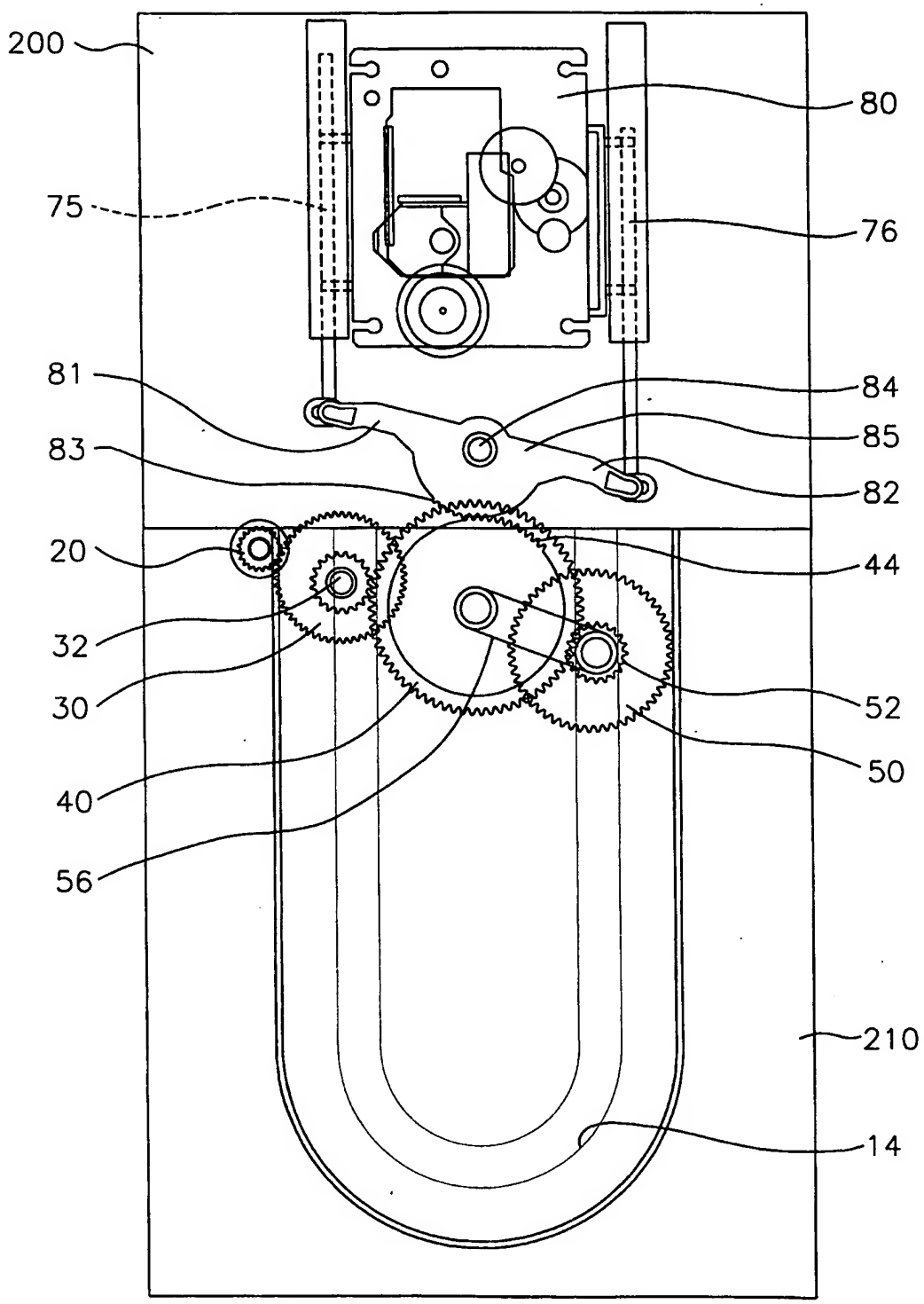


FIG.11

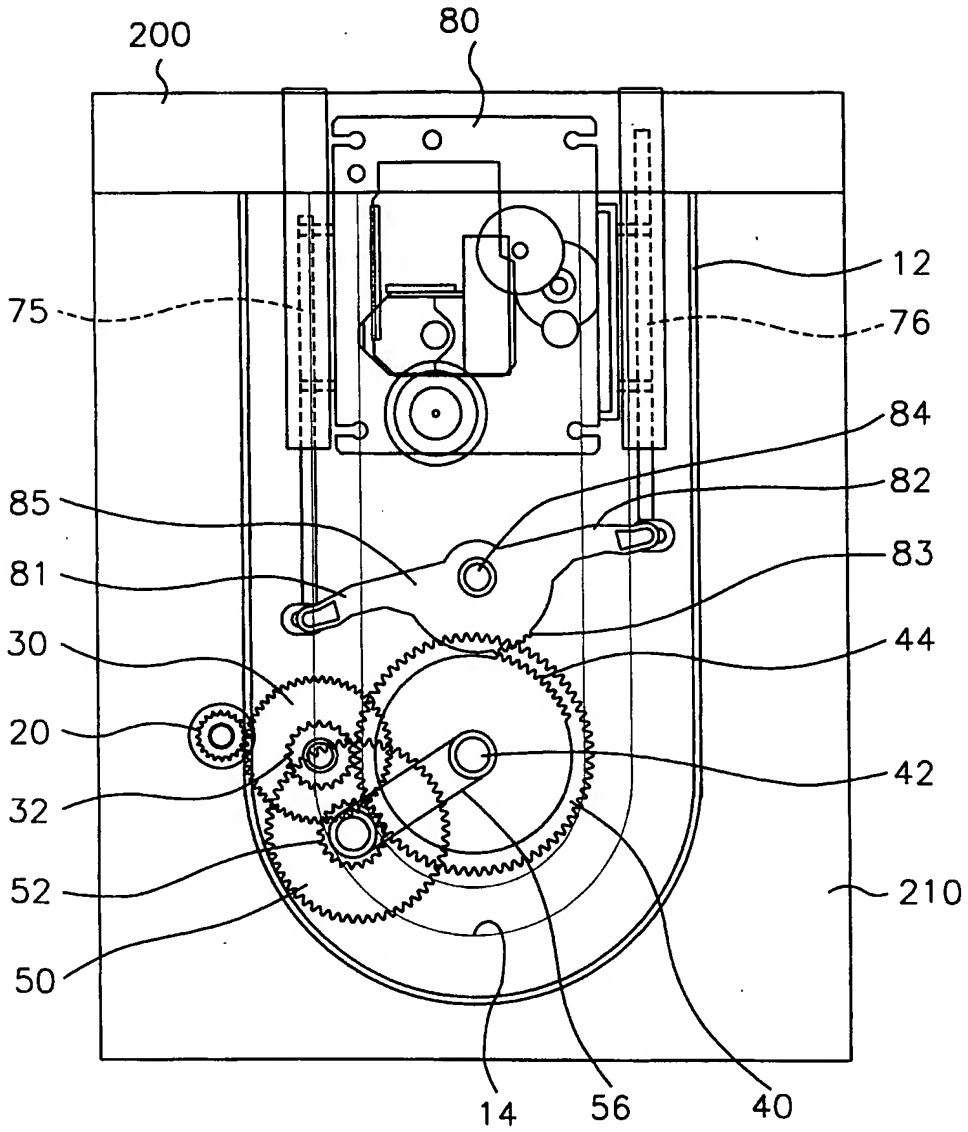


FIG.12

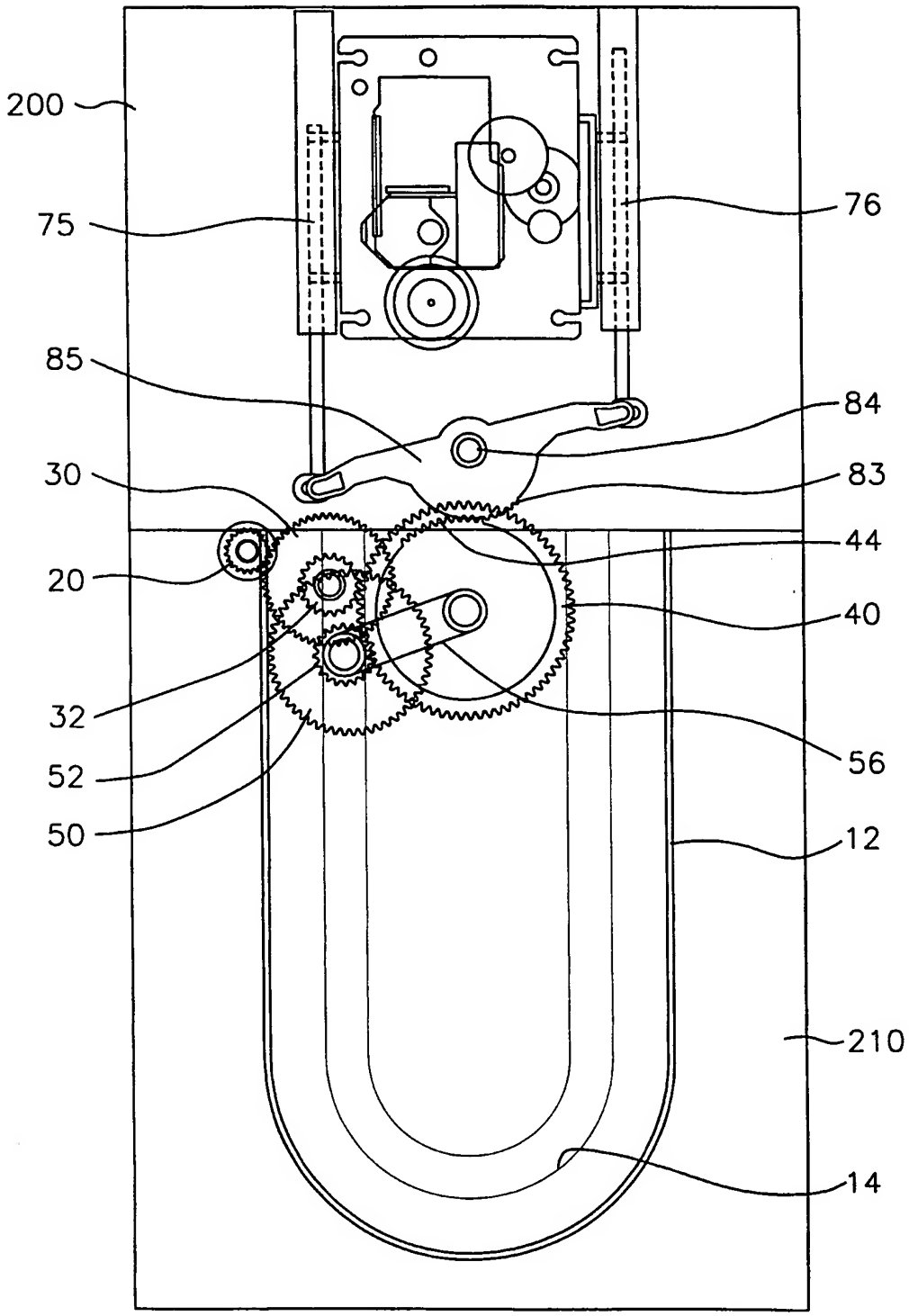


FIG.13A

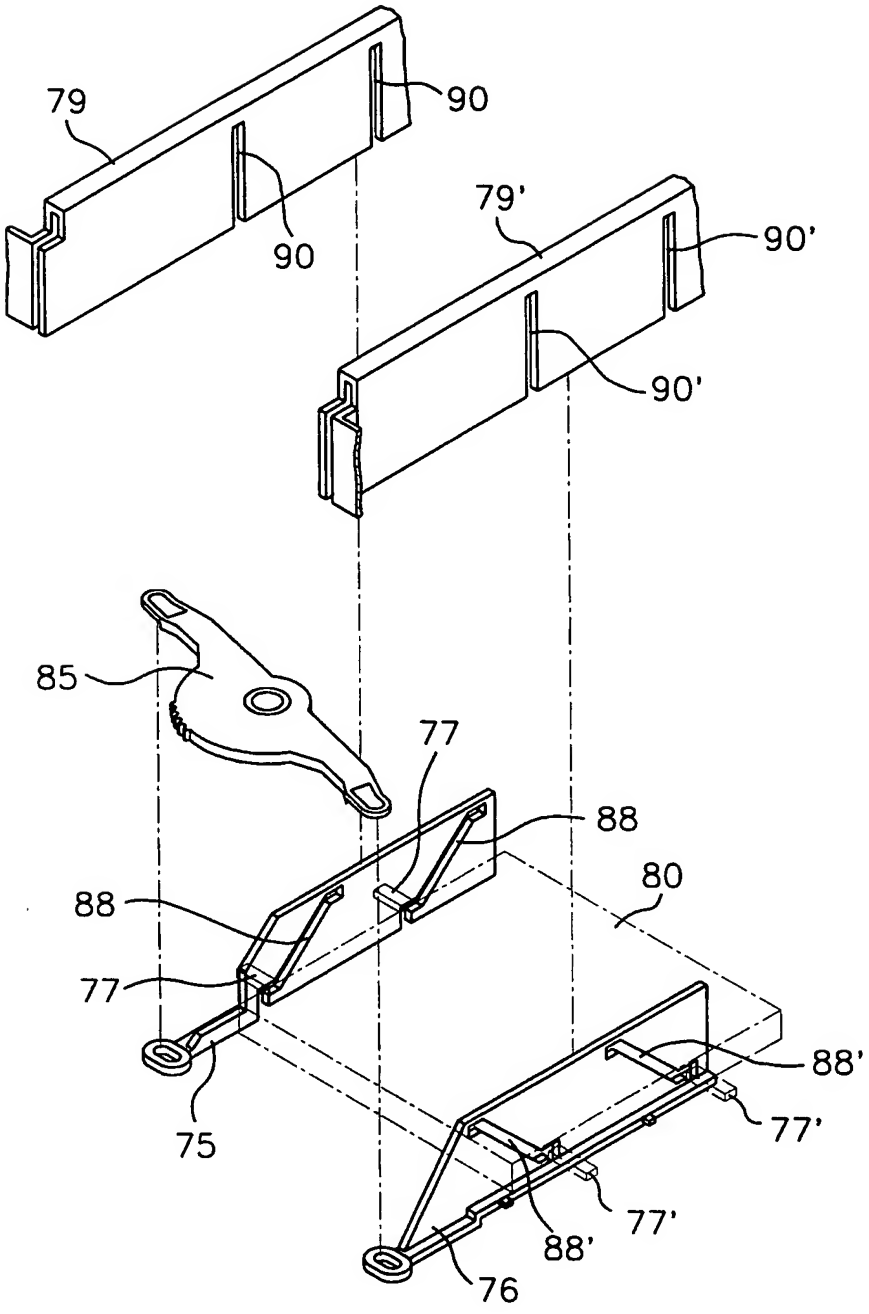


FIG.13B

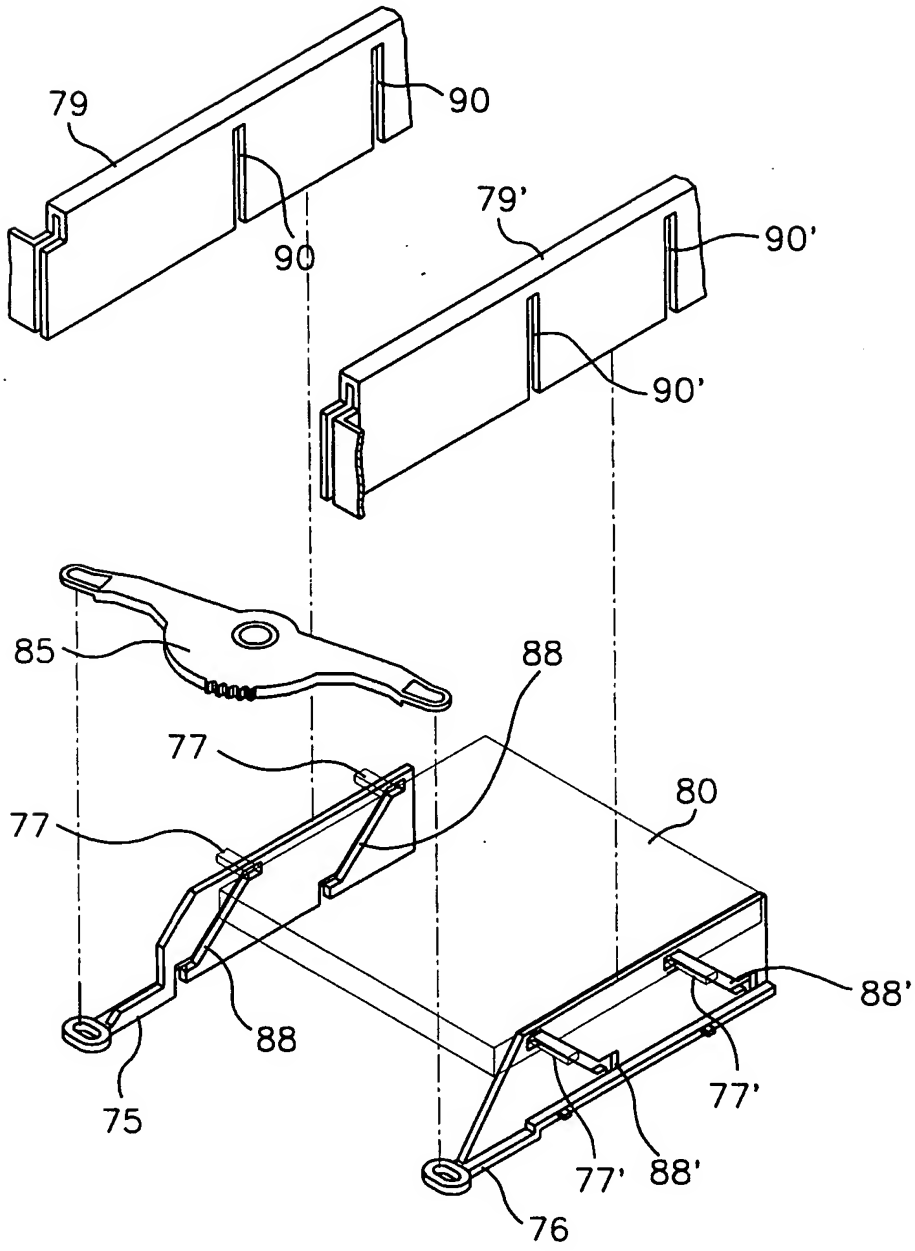


FIG.14

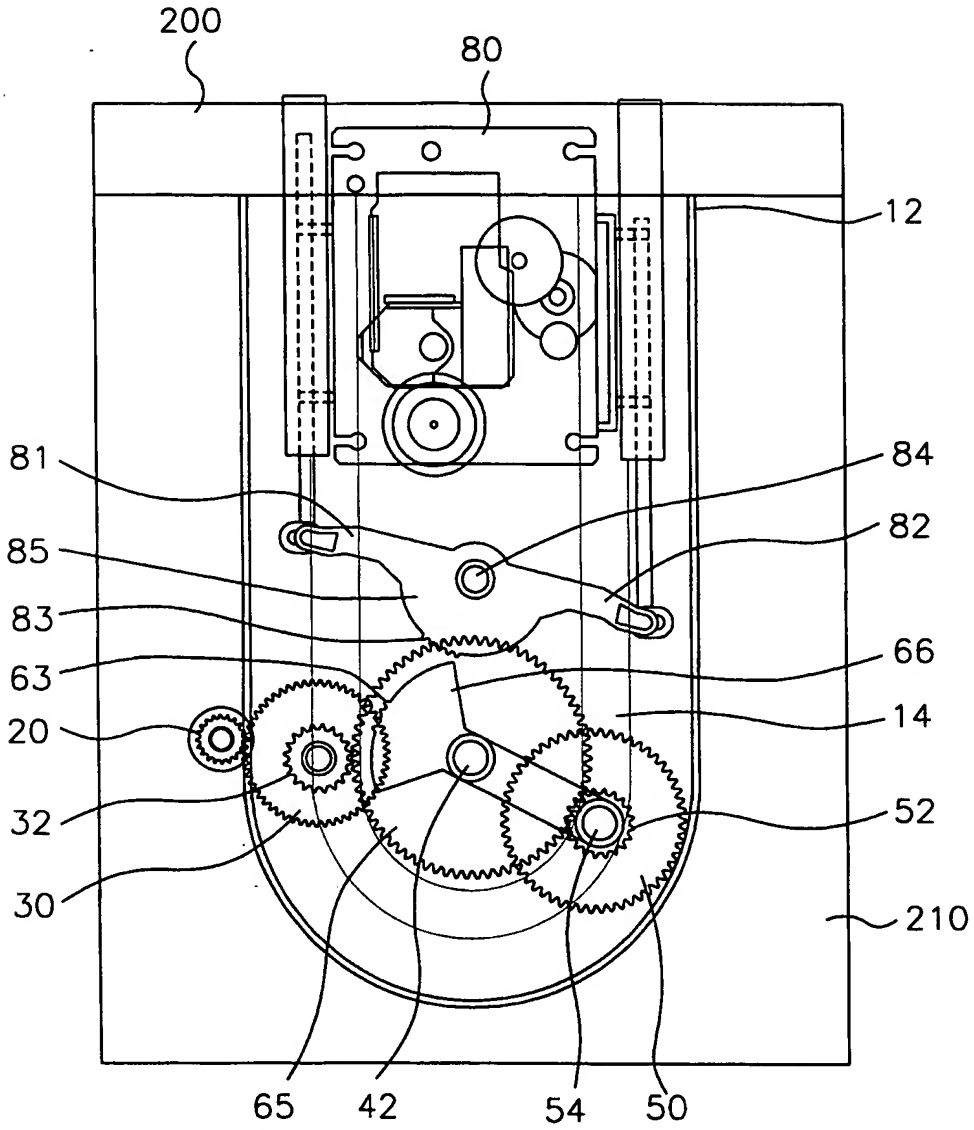


FIG.15

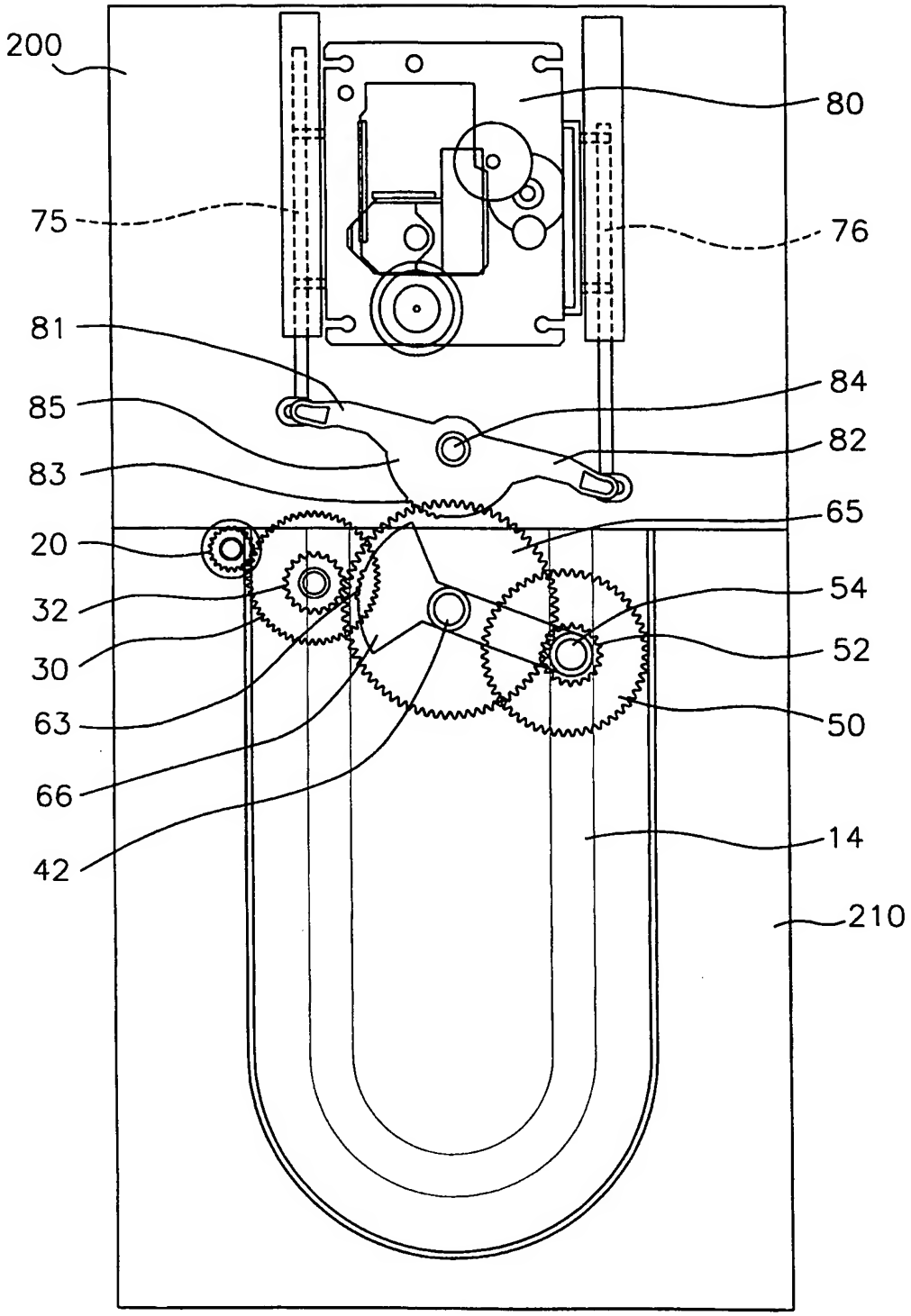


FIG.16

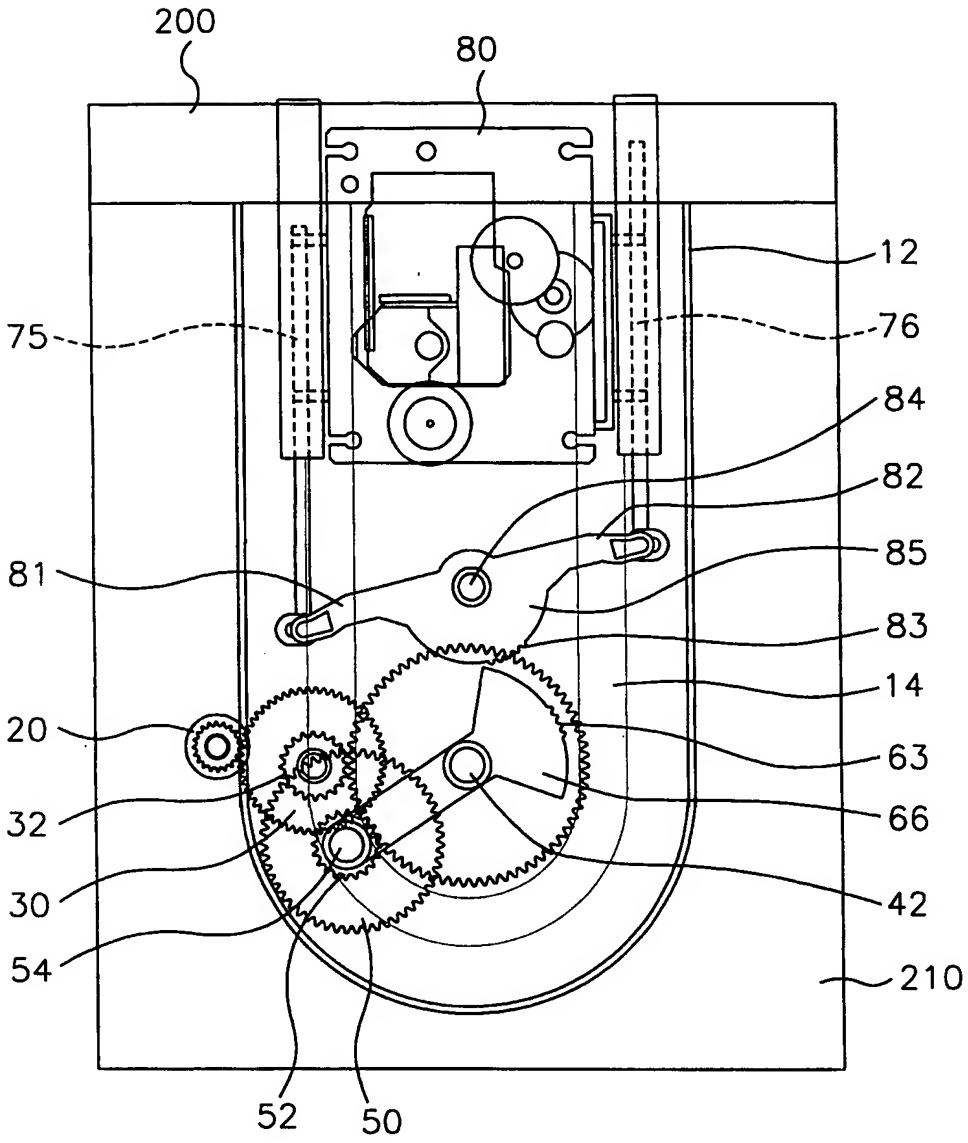
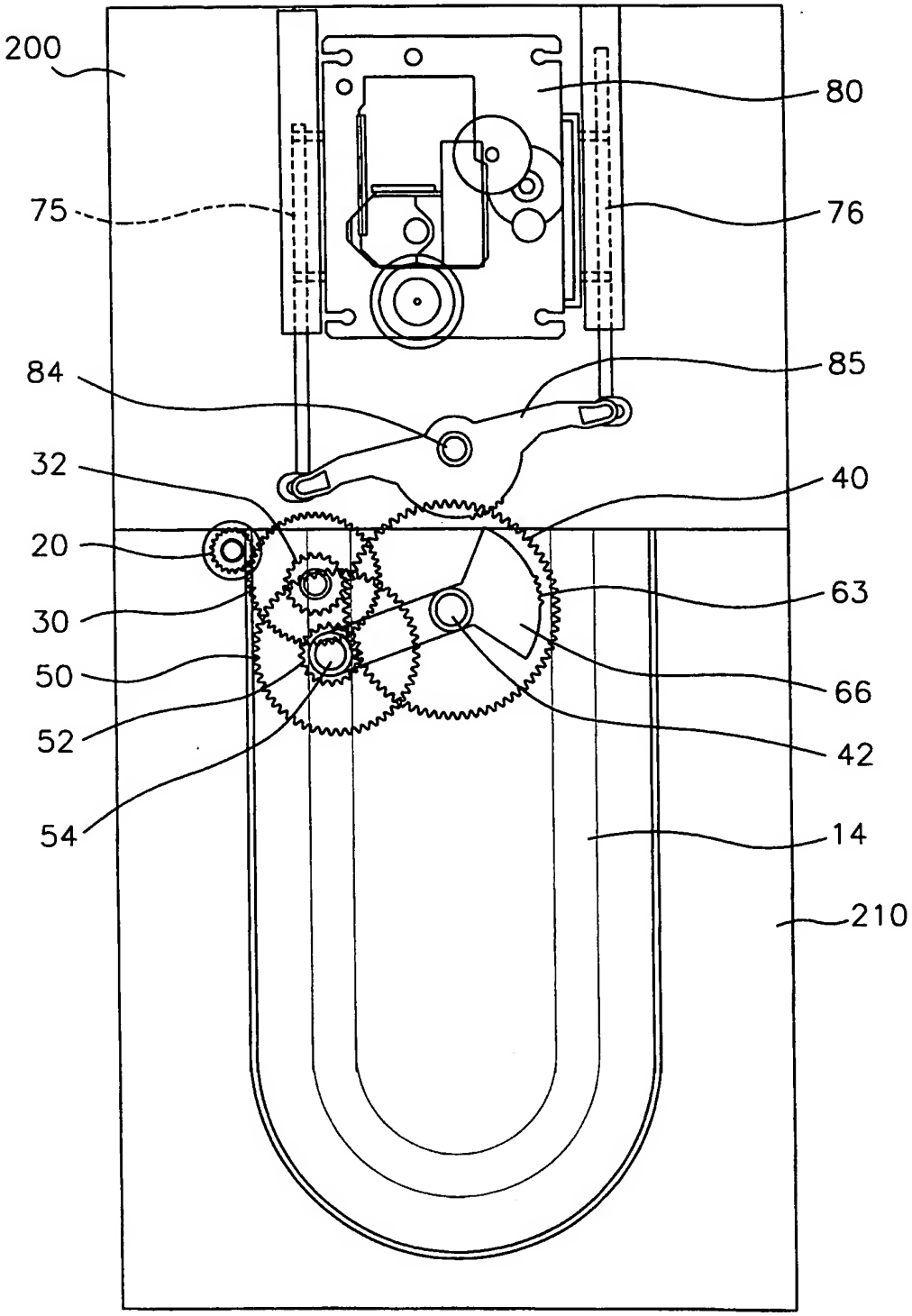


FIG.17



INTERNATIONAL SEARCH REPORT

Internat[illegible] application No.
PCT/KR 98/00345

A. CLASSIFICATION OF SUBJECT MATTER

IPC[6]: G 11 B 17/08,17/24,17/10,17/035,17/00,17/22,17/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC[6]: G 11 B 17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan, Vol.96, No.8, 1996, JP 08-102123 A (AIWA CO., LTD.) 30 August 1996 (30.08.96).	1-7
A	DE 37 05 007 C2 (SONY CORP.) 04 May 1995 (04.05.95), fig.1-4; claims 1-4.	1-7
A	US 5 293 362 A (SUKARAI et al.) 08 March 1994 (08.03.94), abstract; fig.1,5,6; claim 1.	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 January 1999 (12.01.99)	25 January 1999 (25.01.99)

Name and mailing address of the ISA/	Authorized officer
Austrian Patent Office Kohlmarkt 8-10; A-1014 Vienna Facsimile No. 1/53424/535	Berger Telephone No. 1/53424/453

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Internat[illegible]l application No.
PCT/KR 98/00345

In Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
DE C2 3705007	04-05-95	CA A1 1262774	07-11-89
		DE A1 3705007	20-08-87
		FR A1 2594588	21-08-87
		FR B1 2594588	09-02-90
		GB A0 8703244	18-03-87
		GB A1 2187877	16-09-87
		GB B2 2187877	08-11-89
		JP A2 62192062	22-08-87
		JP B4 6075329	21-09-94
		KR B1 9411087	23-11-94
		US A 4755978	05-07-88
US A 5293362	08-03-94	JP A2 5128693	25-05-93
		JP B4 7122951	25-12-95

Form PCT/ISA/210 (patent family annex) (July 1998)